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(54) STEREOSCOPIC IMAGE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To enable stereoscopic observation which is always normal even if a visual point changes by detecting both eyes of an observer in a face areatracking both eyesand enlarging or reducing the detected face area.
SOLUTION: According to previously set complexion color informationa video processing means 126 detects the face position of the observer. Control is so performed that while the observer is observing a displaythe face area is always in the center of the screen and of constant size. In this face areamatching is carried out to detect both eye positions of the observer. The information on the visual point on the display is calculated from information on both eye positions on the screen and current zoomingpanningand tilting information on the camera from a camera control means 127 and sent to a signal composite circuit 330. Thusthe camera control means 127 enlarges or reduces the face area detected by the video processing means 126 having the function for detecting both eyes of the observer in the face area and the function for tracking both detected eyes.

CLAIMS

[Claim(s)]
[Claim 1]A stereoscopic picture display device having a graphic processing means characterized by comprising the followingand a camera control means which expands or reduces a face area detected by this graphic processing means.
A viewpoint detecting mechanism which detects an observer's viewpoint.
In a stereoscopic picture display device which observes this parallax picture in three dimensions using a display and a device which carry out follow-up control of the parallax picture corresponding to an observer's right-and-left both eyes to view informationand display itA function for this viewpoint detecting mechanism to detect a face area from an observer's video information incorporated by imaging means which incorporates an observer as video informationand this imaging meansand to detect an observer's both eyes from this face areaand a function which carries out tracking of the detected both eyes.

[Claim 2]A stereoscopic picture display device of claim 1wherein said imaging means has a video camera and said camera control means has a mechanism which carries out pan tilt of this video camera.
[Claim 3]Claim 1 having a signal switching means for taking out a video signal from said imaging meansand a control signal of zoom pan tilt from said camera control means outsideor 2 stereoscopic picture display devices.
[Claim 4]Claims 1 and 2 identifying sexual desire news which said graphic processing means was incorporated and was beforehand set up from a **** observer's video informationor 3 stereoscopic picture display devices.
[Claim 5]A stereoscopic picture display device of claim 4 with which said sexual desire news set up beforehand is characterized by color of an observer's faceor a standardly beige thing.
[Claim 6]When identifying information beforehand set up by said graphic processing means and a field which corresponds to the color in incorporated video information is not detectedClaim 4 controlling in a focal distance which controlled a focal distance of said video camera to the short focus distance sideand was beforehand set up when detectedor 5 stereoscopic picture display devices.
[Claim 7]Claims 4 and 5 having a warning means for telling an observer about it when identifying sexual desire news beforehand set up by said graphic processing means and a field applicable in incorporated video information at the sexual desire news is not detectedor 6 stereoscopic picture display devices.
[Claim 8]A stereoscopic picture display device of claim 8 identifying a pattern space which said graphic processing means was incorporated and was beforehand set up from a **** observer's video information.
[Claim 9]A stereoscopic picture display device of claim 1wherein said pattern set up beforehand is a part image which constitutes eyessuch as luster near an observer's

eyes or a standard eyeand the eyes.
[Claim 10]A stereoscopic picture display device of claim 1 having an image recording means for recording a graphic processing means for creating said color set up beforehand or a pattern from an observer's face image informationand its information.
[Claim 11]A stereoscopic picture display device of claim 1 having a switching means for displaying an observer's face image information incorporated with said video camera on a display indicator.
[Claim 12]A stereoscopic picture display device of claim 11 having a control means for an observer to set manually an observer's face image displayed on said display indicator as a position and a size in which it was beforehand provided on a display screen.
[Claim 13]A stereoscopic picture display device of claim 1wherein said graphic processing means carries out tracking of the specific pattern according to pattern recognition.
[Claim 14]Said specific pattern is a part image which constitutes eyessuch as luster near an observer's eyes or a standard eyeand the eyesA stereoscopic picture display device of claim 13 having a warning means which emits warning when a both-eyes interval (it expects from a video camera) when carrying out tracking of the both eyes is except a regular value.
[Claim 15]A mask pattern which arranged two or more translucent parts and shade parts to a horizontal direction and a perpendicular direction in a predetermined pitch to a display surface of an optical modulator which has discrete pixel structureand this optical modulator.
A light source means which irradiates this optical modulator.
A display which has discrete pixel structure and displayed a synthetic parallax picture using a scanning line.
A viewpoint detecting mechanism which detects view information of a display device and an observer who irradiate a parallax picture displayed on this display with light flux patternized by a pattern of this maskdo the light guide of the light flux based on this parallax picture to an observer's right eye and a left eyeand observe picture information displayed on this display in three dimensions.
The present parallax picture which is the stereoscopic picture display device provided with the aboveconstitutes this synthetic parallax picture from two original parallax pictures corresponding to right and left eyesand constitutes pattern shape and this synthetic parallax picture of this mask pattern based on view information from this viewpoint detecting mechanism is switched and displayed.

[Claim 16]A stereoscopic picture display device of claim 15wherein two original parallax pictures which constitute said synthetic parallax picture are pictures observed from a viewpoint which carried out interocular distance correspondence.
[Claim 17]Claim 15 dividing into two or more fields an irradiation area of stripe shape

which constitutes a level element of a translucent part of a mask pattern of this optical modulator from two or more pixelsand on which it is projected in an observation positionand controlling itor 16 stereoscopic picture display devices.
[Claim 18]A process of incorporating an observer who observes a stereoscopic picture based on a parallax picture displayed on a display as video informationA process of detecting this observer's face area from this observer's video informationa process of detecting an observer's eyeball from this observer's face areaA stereoscopic picture display method including a process of carrying out tracking of this observer's eyeballa process of detecting an observer's view information from an eyeball of a this observer who detectedand a process of carrying out follow-up control of the parallax picture displayed on this display based on this observer's view information.
[Claim 19]A stereoscopic picture display method of claim 18 including a process of identifying sexual desire news beforehand set to video information of said observer who incorporated.
[Claim 20]Claim 18 including a process to which a method of incorporating this observer's video information is changed when sexual desire news beforehand set up into video information of said observer who incorporated does not existor 19 stereoscopic picture display methods.
[Claim 21]Claim 19 including a process of emitting an alarm signal when sexual desire news beforehand set up into video information of said observer who incorporated does not existor 20 stereoscopic picture display methods.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]When especially this invention performs the three dimentional display of picture information in display devices (display)such as televisionvideoa computer monitorand a game machineand it performs solid observation of this picture information good about a stereoscopic picture display devicewithout using special glassesit is preferred.
[0002]
[Description of the Prior Art]The method of observing conventionally the parallax picture based on a polarization condition which is mutually different using a polarization eyeglass for example as an observation method of a stereoscopic picture by right and left eyesthe method of carrying out the light guide of the predetermined parallax picture to an observer's eyeball from the inside of two or more parallax pictures using a lenticular lensetc. are proposed.
[0003]Without covering a special polarization eyeglassesthe method using the lenticular

lens which performs a stereoscopic picture display provides a lenticular lens in the observer side of a display devicegives directivity for every pixel of the parallax picture displayed on the display deviceand is making the observer recognize a stereoscopic model. Although the method using a lenticular lens had the advantage that a corporal vision was made without using a polarization eyeglassaccording to this methodin order to arrange a lenticular lens sheet in the front face of a displayit had the problem that image quality deteriorated.

[0004]on the other hand — in Japanese Patent Application No. No. 148611 [eight to]Japanese Patent Application No. No. 250943 [eight to]Japanese Patent Application No. No. 211119 [ten to]etc.this invention persons set to a large viewing area (observation area) — fitness — the stereoscopic picture display device which a stereoscopic model can observe is proposed.

[0005]The light source means which illuminates a checkered mask pattern with a translucent part and this mask pattern in the itemIt has a micro optical element which differs in an optical work in a horizontal direction and a perpendicular directionand a transmission type display deviceThe stripe image composing which obtained each of the parallax picture for right eyes and the parallax picture for left eyes by dividing it into the pixel of much stripe shape to this display device is displayedGive directivity to the light flux ejected from this light source means by this micro optical elementand it irradiates with this stripe image composingThe stereoscopic display device make divide the light flux based on the parallax picture of this stripe image composing into at least two fieldsand an observer is made to recognize visually by making this stripe image composing into a stereoscopic picture is proposed.

[0006]By a viewpoint detecting mechanismdetect an observer's neighborhood of a viewpoint (on these specificationsthe center position of the pupil an observer's both eyes is defined as a viewpoint.)and by this viewpoint position information. This parallax picture was switched and displayedor said mask pattern was formed using the optical modulator which has discrete pixel structureand the stereoscopic display device which has a large stereoscopic vision area is proposed by controlling the opening of this mask pattern.

[0007]The position sensing device near the viewpoint is conventionally indicated by JP2-50145A and USP5016282 (priority pat. Application No.63-17589963-19389863-19389963-289761)for example. Five sorts of embodiments are indicated by the former as a device which detects an observer's both-eyes position. As a feature of each of these embodimentsa 1st embodiment is the method of guessing an observer's viewpointby detecting the infrared reflected light from an observeror body temperature by two or more infrared electric eyes.

A 2nd embodiment is the method of using one CCD series which arranged the photo detector for line form as an electric eyeA 3rd embodiment is a device included in the same packageand the source of luminescent light and an electric eye a 4th embodimentIt is the method of measuring luminous intensity distribution by the

electric eye which has arranged the light source at an observer's back and has been arranged in an observer's front faceand detecting an observer's positionand a 5th embodiment is the method of detecting a viewpointby photoing an observer with a TV camera and processing the picture by an image processing technique.

[0008]The latter irradiates an observer with infrared light in accordance with the optic axis of a cameraphotos the catoptric light from an observer's retina or a corneaand is indicating the method of detecting the position of eyesand an observer's point of regard (point which the observer is looking at) from the picture.
[0009]Howeverthere is a fault of we being anxious about the problem of healthy since the method of irradiating with infrared light needs to adjust the intensity of infrared light according to observation distance and always irradiates an observer's eyes with infrared lightand being easy to produce malfunction for catoptric light with glasses in being a glasses user.
[0010]The method of photoing an observer with a TV camera and on the other hand guessing a both-eyes position by image processing had a problem which will be referred to as that processing of mass picture information takes timeand detecting accuracy is not fully acquired by a picture with little amount of information if it is going to raise detection accuracy of position.
[0011]
[Problem(s) to be Solved by the Invention]This invention aims at offer of the stereoscopic picture display device which can observe a stereoscopic picture without carrying the viewpoint detecting mechanism which improved further the stereoscopic picture display device which the above-mentioned this invention persons proposedand conquered the fault of viewpoint detection of said former and needing glasses etc.
[0012]In a large observation regionthis invention aims at offer of the stereoscopic picture display device which enables always normal solid observation to an observer using the detecting mechanism which detects a viewpoint with sufficient accuracyalso when an observer moves and a viewpoint changeswhile the observer is observing the stereoscopic picture displayed on the display.
[0013]This invention aims at offer of the stereoscopic picture display device which always normal solid observation is possiblewithout a reverse corporal vision arising also when the parallax picture displayed simultaneously consists of two parallax pictures corresponding to right-and-left both eyesan observer moves and a viewpoint changesand the stereoscopic picture according to a viewpoint can observe. What [this invention displays warning for when an observer is located outside the observation feasible region of the stereoscopic picture displayed on the display]The video camera for viewpoint detection is made usable as for examplethe camera for teleconferencesor a camera for surveillanceand it aims at offer of the stereoscopic picture display device which improved the user's convenience.
[0014]

[Means for Solving the Problem]A viewpoint detecting mechanism from which a stereoscopic picture display device of this invention detects an observer's (1-1) viewpointIn a stereoscopic picture display device which observes this parallax picture in three dimensions using a display and a device which carry out follow-up control of the parallax picture corresponding to an observer's right-and-left both eyes to view informationand display itThis viewpoint detecting mechanism detects a face area from an observer's video information incorporated by imaging means which incorporates an observer as video informationand this imaging meansIt is characterized by having a camera control means which expands or reduces a face area detected by graphic processing means with a function to detect an observer's both eyes from this face areaand a function which carries out tracking of the detected both eyesand this graphic processing means.

[0015]Said (1-1-1) especially imaging means should have a video cameraand said camera control means should have a mechanism which carries out pan tilt of this video camera.

(1-1-2) Have a signal switching means for taking out a video signal from said imaging meansand a control signal of zoom pan tilt from said camera control means outside.

(1-1-3) Said graphic processing means should identify sexual desire news which was incorporated and was beforehand set up from a **** observer's video information.

(1-1-4) Said sexual desire news set up beforehand is a color of an observer's faceor a standardly beige thing.

(1-1-5) When identifying information beforehand set up by said graphic processing means and a field which corresponds to the color in incorporated video information is not detectedcontrol a focal distance of said video camera to the short focus distance sideand when detectedcontrol in a focal distance set up beforehand.

(1-1-6) When identifying sexual desire news beforehand set up by said graphic processing means and a field applicable in incorporated video information at the sexual desire news is not detectedhave a warning means for telling an observer about it.

(1-1-7) Said graphic processing means should identify a pattern space which was incorporated and was beforehand set up from a **** observer's video information.

(1-1-8) Said pattern set up beforehand should be a part image which constitutes eyessuch as luster near an observer's eyes or a standard eyeand the eyes.

(1-1-9) It has an image recording means for recording a graphic processing means for creating said color set up beforehand or a pattern from an observer's face image informationand its information.

(1-1-10) Have a switching means for displaying an observer's face image information incorporated with said video camera on a display indicator.

(1-1-11) Have a control means for an observer to set manually an observer's face image displayed on said display indicator as a position and a size in which it was beforehand provided on a display screen.

(1-1-12) Said graphic processing means should carry out tracking of the specific pattern according to pattern recognition. Said specific pattern (1-1-13) An observer's eyes or a standard eyeIt is a part image which constitutes eyessuch as luster near the eyesand when a both-eyes interval (it expects from a video camera) when carrying out tracking of the both eyes is except a regular valueit is characterized by having a warning means which emits warning etc.
[0016](1-2) A mask pattern which arranged two or more translucent parts and shade parts to a horizontal direction and a perpendicular direction in a predetermined pitch to a display surface of an optical modulator which has discrete pixel structureand this optical modulatorA light source means which irradiates this optical modulatorand a display which has discrete pixel structure and displayed a synthetic parallax picture using a scanning lineIrradiate a parallax picture displayed on this display with light flux patternized by a pattern of this maskand the light guide of the light flux based on this parallax picture is carried out to an observer's right eye and a left eyeIn a display device and a stereoscopic picture display device which has a viewpoint detecting mechanism which detects an observer's view information which observe picture information displayed on this display in three dimensionsIt is characterized by switching and displaying the present parallax picture which constitutes this synthetic parallax picture from two original parallax pictures corresponding to right and left eyesand constitutes pattern shape and this synthetic parallax picture of this mask pattern based on view information from this viewpoint detecting mechanism.
[0017]Especially two original parallax pictures that constitute said (1-2-1) synthetic parallax picture should be pictures observed from a viewpoint which carried out interocular distance correspondence.
(1-2-2) A level element of a translucent part of a mask pattern of this optical modulator is constituted from two or more pixelsand it is characterized by dividing into two or more fields an irradiation area of stripe shape on which it is projected in an observation positionand controlling it etc.
[0018]A process of incorporating an observer who observes a stereoscopic picture based on a parallax picture which displayed a stereoscopic picture display method of this invention on a display (2-1) as video informationA process of detecting this observer's face area from this observer's video informationa process of detecting an observer's eyeball from this observer's face areaIt is characterized by including a process of carrying out tracking of this observer's eyeballa process of detecting an observer's view information from an eyeball of a this observer who detectedand a process of carrying out follow-up control of the parallax picture displayed on this display based on this observer's view information.
[0019]Include a process of identifying sexual desire news especially set to video information of said (2-1-1) observer who incorporated beforehand.
(2-1-2) When sexual desire news beforehand set up into video information of said observer who incorporated does not existinclude a process to which a method of

incorporating this observer's video information is changed.
(2-1-3) When sexual desire news beforehand set up into video information of said observer who incorporated does not existit is characterized by including a process of emitting an alarm signal etc.
[0020]
[Embodiment of the Invention][Embodiment 1] Embodiment 1 of the stereoscopic picture display device of this invention is described using drawing 21 from drawing 1. Drawing 1 is an outline view of Embodiment 1 of this invention. In the figure100 is a main part which shows this whole device. 110 is a display indicator. 111 is a 3D window as which a stereoscopic model (parallax picture) is displayed in the display indicator 110. 121 is a video camera which is one component of a viewpoint detecting mechanisman eyeball detection meansfor examplea viewpoint detecting mechanismfor 120 to detect an observer's eyeball informationfor examplea viewpoint.
[0021]Drawing 2 is a system block figure explaining the system of Embodiment 1. the optical modulator 240 with which the display indicator 110 consists of the transmission type display devices (display) 210such as a liquid crystala liquid crystal with discrete pixel structureetc. in the figureand the back light source (light source means) 250 — andIt consists of the two lenticular lenses 220230 in which the bus direction arranged between the display 210 and the optical modulator 240 intersects perpendicularly.
[0022]The ordinary two-dimensional picture which has neither a stereoscopic model (parallax picture) with azimuth difference nor azimuth difference in the display 210 is displayed. The field where a parallax picture is displayed is equivalent to the 3D window 111 of drawing 1.
[0023]260 is a display drive circuit and shows the picture on the display 210 based on the signal from the image processing means 270. From the image processing means 270the size of the 3D window 111 and position information are outputted to the signal synthesizing circuit 330.
[0024]The observer's 280 view information detected by the viewpoint detecting mechanism 120 is also outputted to the signal synthesizing circuit 330.
[0025]The signal synthesizing circuit 330 generates the information for driving the optical modulator 240 based on both this informationand outputs information to the light modulator driving circuit 320.
[0026]The optical modulator 240 is driven by the light modulator driving circuit 320and displays uniform concentration on the display surface in the field corresponding to a mask pattern checkered to the field corresponding to 3D window partand a two-dimensional picture display part.
[0027]280 is an observer of the display 210.
[0028]Drawing 3 is an important section schematic diagram of the 3D window part 111.
[0029]In drawing 3as for 250the mask pattern 241 which becomes the display surface

from the translucent part (opening) 242 which light penetratesand the shade part 243 with the optical modulator which it has is formed in a back light source (light source means) and pixel structure with discrete 240.
[0030]230 is a horizontal lenticular lens (lateral cylindrical lens array) which has a bus line to the horizontal direction Xand puts in order and constitutes the horizontal cylindrical lens of much planoconvex shape to the perpendicular direction Y. The horizontal lenticular lens 230 has set up lens curvature so that the translucent part 242 of the mask pattern 241 and the shade part 243 may carry out image formation to the picture display surface of the display device 210. The lens pitch (width) Vl of the horizontal lenticular lens 230 is set up correspond 1 time of the width Vm of the perpendicular direction of the translucent part 242 of the mask pattern 241and the shade part 243or twice. This embodiment shows the case of twice.
[0031]220 is a vertical lenticular lens (vertical cylindrical lens array) which has a bus line to the perpendicular direction Yand puts in order and constitutes the vertical cylindrical lens of much planoconvex shape to the horizontal direction X. Each cylindrical lens which constitutes the longitudinal lenticular lens 220 has set up lens curvature so that the mask pattern 241 may carry out image formation to an observation position.
[0032]The horizontal pitch Hm of the translucent part 242 of the mask pattern 241 and the shade part 243 supports 1 pitch (width) Hl of the vertical cylindrical lens of the longitudinal lenticular lens 220.
[0033]In drawing 3the cover glass of the display device 210 and the optical modulator 240a polarizing platean electrodeetc. are omitted and shownand the display image of a display surface and mask pattern shape are displayed typically.
[0034]El and Er show the image observation person's 280 right and left eyesrespectively.
[0035]Herethe mask pattern 241 which consists of the translucent part 242 displayed on the optical modulator 240 and the shade part 243 is explained using drawing 4. Drawing 4 shows the front view of the mask pattern 241 shown in drawing 3.
[0036]As shown in the figurethe mask pattern 241 comprises the horizontal pitch Hmand the vertical translucent part 242 and the shade part 243 of the width Vm. The translucent part 242 comprises the three pixels 244245246and the shade part 243 comprises three pixels similarly.
[0037]Nextthe parallax picture displayed on the display device 210 is explained using drawing 5. By drawing 5it divides into the strip image of much horizontal stripe shape so that two parallax picture G (1) of right-and-left-eyes correspondence and G (2) may be illustratedand it can stand in a line for every scanning lineand strip image G(1) i and G (2) i which is an element of parallax picture G (1) and G (2) is changedand let it be the synthetic parallax picture G (12).
[0038]Nextan operation of a stereoscopic picture display is explained using drawing 6 – drawing 9.

[0039]Drawing 6 is a horizontal sectional view (X-Z section) of the 3D window part 111.
[0040]In the figurethe light from the back light source 250 is ejected from the translucent part 242 of the mask pattern 241 of the optical modulator 240and passes the horizontal cylindrical lens 230. (in this cross sectioned directiona horizontal lenticular lens in particular does not carry out an optical effect.) -- and the transmitted light flux from the translucent part 242 of the mask pattern 241 is irradiated by exposure parallax picture field GS1 in an observer's position with each cylindrical lens which constitutes the vertical lenticular lens 220.
[0041]The light flux irradiated by this exposure parallax picture field GS1 is modulated with the synthetic parallax picture displayed on the display device 210 formed between the longitudinal lenticular lens 220 and the observer. Since it passes along element strip image G(1) 1 of parallax picture G (1) which constitutes the synthetic parallax picture G (12) shownfor example by drawing 5 from this sectionG(1) 3G(1) 5and --the parallax picture G1 is observed in exposure parallax picture field GS1.
[0042]Heresince the translucent part 242 of the mask pattern comprises the three pixels 244245246the light flux which passed along each pixel will irradiate with the field 247248249respectively.
[0043]Similarlyit is irradiated with the light flux of the section equivalent to the scanning line of under 1 scanning line of drawing 6or a top by exposure parallax picture field GS2 as shown in drawing 7. The light flux irradiated by this exposure parallax picture field GS2 is modulated with the synthetic parallax picture displayed on the display device 210 formed between the longitudinal lenticular lens 220 and the observer. Since it passes along element strip image G(2) 2 of parallax picture G (2) which constitutes the synthetic parallax picture G (12) shown by drawing 5 from this sectionG(2) 4G(2) 6and --the parallax picture G2 is observed in exposure parallax picture field GS2. This field also comprises three subregions.
[0044]Drawing 8 is the vertical cross section (Y-Z section) of the window 111 for a stereoscopic picture display. Although the image of the translucent part 242 of the mask pattern 241 irradiated by the back light source 250 carries out image formation to the picture display surface of the display device 210 by operation of the horizontal lenticular lens 230 in this sectionIn that casethe width of the translucent part 242 of the optical modulator 240 has composition which carries out image formation for the magnification which becomes the pixel width of the display device 210. Thereforeonly the element strip image of the parallax picture of G (1) is irradiatedfor example by setting up appropriately the position of the optical modulator 240the display device 210and the horizontal lenticular lens 230.
[0045]Similarlyas shown in drawing 9in the pixel row beside [1 pixel] drawing 8only the element strip image of parallax picture G (2) is irradiated.
[0046]Thereforeparallax picture G (1) and G (2) are set as the eyeball El and the parallax picture corresponding to Erand by putting the eyeball El and Er on exposure

parallax picture field GS1 and GS2respectivelyan observer will separate and observe a parallax picture by an eye on either sideand can observe a stereoscopic picture.
[0047]Drawing 10 – drawing 12 are the explanatory views showing the above-mentioned operation typically.
[0048]In drawing 10a left-hand side figure is the principal part of the horizontal sectional view (X-Z section) of a displayand the mask pattern 241 of the optical modulator 240the synthetic parallax picture 211 displayed on the display device 210and the exposure parallax picture 290 irradiated by the observer position are shown in right-hand side.
[0049]The exposure parallax picture 290 shows the state where it consists of a parallax picture of parallax picture G (1) and G (2)and the figure has an observer's right and left eyes El and Er in the position of parallax picture G (1) and G (2)respectively.
[0050]When an observer moves to a left and changes into the state of drawing 11 from this stateor when it moves to the right direction and changes into the state of drawing 12 (i.e.when the parallax picture G2 and G1 are observed by the right and left eyes El and Errespectively)it becomes a reverse corporal vision and normal solid observation becomes impossible.
[0051]Herethe constituent conditions of the optical system in a horizontal section (X-Z section) are explained using drawing 6.
[0052]In this specificationthe distance between each optical element is dealt with by scaled distance. In the display device 210 and the optical modulator 240 with scaled distanceIt is what is called optical distance that converted the distance between two optical system elements into the value in the air in the picture display surfacethe mask pattern display surfaceand the lenticular lens 220230 by making into a reference point the principal point of the side which tries to measure distancerespectively.
[0053]As shown in the figureThe distance of the vertical lenticular lens 220 and the mask pattern 241. (The optical interval which converted the distance of the principal point by the side of the mask pattern of the longitudinal lenticular lens 220and the mask pattern 241 into the value in the air) Lh2The horizontal width of the translucent part 242 of Lh1 and the mask pattern 241 for the distance (optical interval converted into the value in the air of an observation position and the principal point by the side of the observer of the longitudinal lenticular lens 220) from the observation position defined beforehand to the longitudinal lenticular lens 220 HmwWhen setting the interval of the right and left eyes of Hl and an observer to E for the pitch (width) of the vertical cylindrical lens which constitutes Hm and the longitudinal lenticular lens 220 for the horizontal pitch to an adjacent translucent partit constitutes so that the following conditions may be fulfilled.
[0054]
2xE/Hm = Lh1/Lh2. ..... Formula 1Lh1/(Lh1+Lh2) = Hl/Hm ..... Formula 22xHmw= Hm ..... The function in which an always normal stereoscopic model is

observable is explained without the state of a reverse corporal vision arisingalso when the formula 3next an observer's viewpoint change.
[0055]In old explanationwhen the eye of an observer's right and left was in the field to which the parallax picture corresponding to each eye is irradiatedthe normal corporal vision was possiblebut when that was not rightit changed into the state of a reverse corporal visionand the normal corporal vision became impossible.
[0056]In order to cancel thisas this Embodiment 1 shows to system block drawing 2In response to the observer's 280 view information acquired by the viewpoint detecting mechanism 120it has the composition of changing with light modulator driving circuits 320 the pattern shape of the mask pattern 241 displayed on the optical modulator 240 according to a viewpoint.
[0057]Observation of an always normal stereoscopic model is possiblewithout the state of a reverse corporal vision arising by carrying out follow-up control of the exposure parallax picture field in which a corporal vision is possible at the viewpointalso when an observer's observation changes if view information is acquired by the viewpoint detecting mechanism 120 explained in full detail behind.
[0058]The operation is explained using drawing 13 – drawing 16.
[0059]Drawing 13 is drawing 10 and status idemand the right and left eyes El and Er are observing parallax picture G (1) and G (2)respectivelyand show the state of a normal corporal vision.
[0060]Although right and left eyes are located in the positions 8 and 11 of the exposure parallax picture 290respectively at this timeWhen an observer moves from this stateas shownfor example in drawing 14right and left eyes G (1)The synthetic parallax picture 211 of a display remains as it isand when it goes into the field (positions 7 and 10 of the exposure parallax picture 290) on the left of [one] three subregions of G (2)as shown in a figureit moves the translucent part 242 of the mask pattern 241 to the 1-pixel left. The exposure parallax picture 290 moves to the left by stroke matter corresponding areas by this.
[0061]By controlling in this wayalthough the observer moved to the field on the left of [one] three subregions of G (1) and G (2)the state where it is looking in the subregion of the center of each parallax picture G (1) and G (2) is held.
[0062]The synthetic parallax picture 211 of a display remains as it is so that an observer may move to the right and it may illustrate in the state where right and left eyes are located in the positions 9 and 12 of an exposure parallax picture like drawing 15By moving the translucent part 242 of the mask pattern 241 to the 1-pixel rightas shown in a figurethe exposure parallax picture 290 moves to the right by stroke matter corresponding areas. From this statein the state of drawing 16 which the observer moved to the right directionthe synthetic parallax picture 211 remains as it isand can move the exposure parallax picture 290 to the stroke matter corresponding-areas part right further by moving 1 more pixel of mask patterns 241 like a graphic display.

[0063]Hereaftersame control is performed to movement of an observer's right and left.
[0064]As mentioned abovethe stereoscopic model observation stable always which a reverse corporal vision does not produce is attained by controlling a corresponding exposure parallax picture field to come to the position of right and left eyes by switching a mask pattern one by one and displaying it according to a viewpointusing the synthetic parallax picture compounded from the original parallax picture of two images.
[0065]The above is also the same as when n is four or morealthough the case where the composition pixel number n of the translucent part of a mask pattern and a shade part was three piecesrespectively was explained.
[0066]Nextthe viewpoint detecting mechanism (eyeball detecting mechanism) 120 which detects an observer's viewpoint is explained using drawing 17 – 21.
[0067]A viewpoint needs to detect the position of an observer's eye with sufficient accuracy of position required for follow-up control. Drawing 17 is a system block figure of the viewpoint detecting mechanism 120. In the figure120 shows the whole viewpoint detecting mechanism121 is a video camera (imaging means) for photoing an observerand this video camera 121 comprises the video photographing means 123 containing image pick-up sensorssuch as the taking lens 122 and CCD.
[0068]The taking lens 122 comprises a zoom lens andthereforethe focal distance of a taking lens is controlled by the zoom control means 124. This zoom control means 124 is controlled by the control signal from the outsideand outputs lens informationsuch as focal distance information of a taking lensoutside.
[0069]125 is a camera platform of the video camera 121and has a means to have a control means which performs the bread and tilt of the video camera 121and to output the bread of a cameraand tilted position information.
[0070]127 is a camera control means which delivers and receives the graphic processing means 126 and informationand controls operation of these cameras.
[0071]126 is a graphic processing meansand it generates the information for controlling the zoom lens 122 if neededor performing pan tilt operation of the video camera 121 while it performs image processing required for viewpoint detection based on the video information of the video photographing means 123and the information from the camera control means 127. The view information acquired by the graphic processing means 126 is sent to the signal synthesizing circuit 330 of drawing 2.
[0072]An operation of the viewpoint detecting mechanism 120 is explained below.
[0073]Since the video camera 121 is installed so that the image of the transverse plane of a display may be incorporated as shown in drawing 1the image of an observer's face is picturized in the state where an observer usually observes a display.
[0074]In the state where an observer is in the position from which it separated from the transverse plane of a displayand the observer's face information data are not picturized. Since the focal distance of the taking lens 122 is automatically set to the short focus side so that it may describe laterif an observer's face is within the limits

of the limiting area by the side of the short focus of a camerathe image of the observer containing a face will be photoed.
[0075]Drawing 18 is in the state where the taking lens 122 was set to the short focus sideand shows the observer's 280 image 281 photoed with the video camera 121. 282 is the photoed screen.
[0076]If an observer's viewpointi.e.an observer's both-eyes positionis detectable from the face image shown in this drawing 18 in sufficient accuracy required for the corporal vision control described previouslythe purpose will reachbut. For that purposein using CCDfor example for an image sensorit needs an element with a big pixel numberfor detecting the position of a direct eye from video information with much amount of information obtained from the image sensor with many pixel numbers at an expensive priceimage processing takes timeand it is not practical.
[0077]Thereforewith this devicepublicly known "method of extracting a feature region using sexual desire news" is used to the face image shown in this drawing 18and the graphic processing means 126 detects an observer's face position based on the beige information set up beforehand.
[0078]283 of drawing 18 shows the face area detected by this method. This face area based on the center position of the detected face area 283and size information in the center of a screen. And a control signal is sent to the zoom control means 124 and the camera universal head 125 via a camera control means from the graphic processing means 126 so that a size may turn into a predetermined sizeand the zoom of a camerabreadand a tilt are performed.
[0079]As a resultdrawing 19 is an observer's face image photoed with the camera.
[0080]After thiswhile an observer observes a displaythere is a face area in the center of Screen 282and a size always controls uniformly.
[0081]An observer moves greatlywhen it separates thoroughly from a screenand an observer does the quick motion beyond regulation and detection of a face area is not completed by a certain causea taking lens is set to the short focus sideand face area search by the side of a short focus is performed again.
[0082]Drawing 20 is the elements on larger scale of drawing 19.
[0083]Nexta graphic processing means to have the function which used the publicly known "template-matching method" in this face area 283 detects both-eyes position information.
[0084]Drawing 21 shows the template of the both eyes which constitute an element of a graphic processing means. 284285 is a template of right and left eyesrespectively. this template 284285 — an observer — the picture of the both eyes which the person himself/herself 280 photoed beforehandor the picture of a standard eye is used.
[0085]Matching operation is performed in the field of the face area 283 shown in drawing 20 using this templateand an observer's both-eyes position is detected.
[0086]The state where the both-eyes position was detected is shown in drawing 20.

Under the present circumstancesabout each eyesearch of both eyes gives flexibility to some extentand absorbs gap of the both-eyes position by movement of dispersion between an observer's eyes or the cross direction of a viewpoint by carrying out independently.

[0087]Thusif searched for the position of eyestracking will be performed by the publicly known "template-matching method" using the template 284285 of eyesand the position information on the eye on Screen 282 according to an observer's motion will be acquired.

[0088]The view information over a display is computed from the both-eyes position information on Screen 282 detected as mentioned aboveand the zoom of the camera from the camera control means 127 at this timebread and tilt informationand it sends to the signal synthesizing circuit 330.

[0089]The template 284285 of eyes may set the range as the whole eye including the neighborhood of eyesas shown in drawing 21and it may set it as the subregion of eyessuch as a size of the luster of eyes.

[0090][Embodiment 2] Embodiment 1 of this invention is an image display device which uses the parallax picture of a right-and-left coupleand makes a normal corporal vision possible from a large observation area.

[0091]On the other handalthough the number of the parallax pictures displayed simultaneously is two like Embodiment 1Embodiment 2The possible stereoscopic picture display device of a what is called surroundings lump display which can always carry out a corporal vision normally is provided without the state of a reverse corporal vision producing the stereoscopic picture according to the observer's viewpoint using the parallax picture of a large number photoed by the regular photographing condition.

[0092]The stereoscopic picture display device of Embodiment 2 is explained focusing on Embodiment 1 and a point of difference using drawing 30 from drawing 22.

[0093]An outline view is drawing 1 andin a system block figuredrawing 2 and 3D window important section schematic diagram of the front view of drawing 3 and a mask pattern are the same as that of Embodiment 1 of drawing 4.

[0094]Drawing 22 is an explanatory view of the synthetic method of the parallax picture used by Embodiment 2.

[0095]As Embodiment 1 explainedthe composition pixel number of the translucent part of a mask pattern and a shade part is set to nrespectivelyIt divides into the strip image of much horizontal stripe shape so that two parallax picture g(i) corresponding to right and left eyes and g (i+n) may be illustratedIt can stand in a line for every scanning lineparallax picture g(i)strip image g(i)j created from g (i+n)and g(i+n) j are changedand it is considered as the synthetic parallax picture g (ii+n).

[0096]Original parallax picture g(i) and g (i+n) which are used for composition are produced as follows.

[0097]Drawing 23 is an explanatory view explaining the law which carries out the

method of creation of the original parallax picturefor example using two or more video cameras (production of the parallax picture by CG also applies to this.).
[0098]The parallax picture generally used for the stereoscopic display device of a binocular disparity method makes parallel the two cameras G1 and the optic axis of G2as shown in drawing 23 (A)and it uses the picture which detached and photoed the distance equivalent to the interval (interocular distance) of human being's both eyes. In the case of a still pictureparallel translation of the one camera may be carried outand it may be photoed.
[0099]Howeverthe distance between optic axes of a camera and the distance of parallel translation are suitably set up by conditionssuch as magnification of the size of a display screenthe distance from an observerthingand a display image.
[0100]When distance between cameras of the original parallax picture used by Embodiment 1 is set to Ein Embodiment 2two or more picture g (1) photoed in a distance between cameras equal to *E as shown in drawing 23 (B) (1/n)g (2)g (3)and .... are used as an original parallax picture.
[0101]By the following explanationin order to explain plainlythe case of n= 3 is explained. Detection of the view information to be used is based on the method described in Embodiment 1.
[0102]An operation of a stereoscopic picture display only differs in the shape of the mask pattern 241 displayed on the optical modulator 240and the contents of the synthetic parallax picture displayed on the display 210and is the same as that of drawing 6 of Embodiment 1 – drawing 9. Thereforethe state of being equivalent to drawing 10 of Embodiment 1 comes to be shown in drawing 24. In drawing 24a left-hand side figure is the principal part of the horizontal sectional view of a displayand the mask pattern 241 of the optical modulator 240the synthetic parallax picture 211 displayed on the display device 210and the exposure parallax picture 290 irradiated by the observer position are shown in right-hand side. The exposure parallax picture 290 shows the state where it consists of parallax picture g(i) and g (i+3)and the figure has an observer's right and left eyes El and Er in the position of parallax picture g(i) and g (i+3).
[0103]When an observer moves to a left and changes into the state of drawing 25 in the state as it isor when it moves to the right direction and changes into the state of drawing 26 (i.e.when the parallax picture of g (i+3) and g(i) is observed by right and left eyesrespectively)it becomes a reverse corporal vision and normal solid observation becomes impossible.
[0104]Belowthe function in which observation of an always normal stereoscopic model is possibleand a what is called surroundings lump display which can perform observation of the stereoscopic picture from which the viewpoint changed according to an observer's motion is possible is explained using drawing 27 – drawing 30without the state of a reverse corporal vision arisingalso when an observer's viewpoint changes.

[0105]Drawing 27 is drawing 24 and status idemand at this timeright and left eyes are observing parallax picture g(i) and g (i+3)respectively as above-mentionedand show the state of a normal corporal vision.
[0106]These right and left eyes from the state where it is located in the positions 8 and 11 of the exposure parallax picture 290respectively. When an observer movesas it is shownfor example in drawing 28when right and left eyes go into the fields 7 and 10 on the left of [one] three subregionsthe synthetic parallax picture 211 of a display Former g(i)The parallax picture of g (i+3) displays g (i+1) and g (i+4) on the line currently displayedrespectivelyand as shown in a figureit moves the translucent part 242 of the mask pattern 241 to the 1-pixel left. As shown in a figurethe parallax pictures g (i+1) and g (i+4) are displayed on the exposure parallax picture 290 by this.
[0107]By controlling in this wayan observer will observe g (i+1) and g (i+4) by right and left eyesrespectivelyand can observe the picture from which the viewpoint changed in the state of the normal corporal vision.
[0108]So that it may illustrate in the state where the right and left eyes of drawing 29 which the observer moved to the right are located in the positions 9 and 12 of the exposure parallax picture 290g (i-1) and g (i+2) are displayed on the exposure parallax picture 290 like a graphic display by displaying g (i-1) and g (i+2) on the synthetic parallax picture 211 of a display like a graphic displayand moving the translucent part of the mask pattern 241 to the 1-pixel rightas shown in a figure. From this statefurther in the state of drawing 30 which the observer moved to the right directionThe parallax pictures g (i-2) and g (i+1) are displayed on the exposure parallax picture 290 by the position of a graphic display by displaying g (i-2) and g (i+1) on the synthetic parallax picture 211and changing the mask pattern 241 to the state of a graphic display. Hereaftersame control is performed to movement of an observer's right and left.
[0109]As mentioned abovethe solid observation in which the surroundings lump display which a reverse corporal vision does not produce is possible is attained by switching the synthetic parallax picture and mask pattern which are displayed on a display according to a viewpoint one by oneand displaying them using many parallax pictures.
[0110]Although the number of the parallax pictures displayed simultaneously is two and the case where the translucent part of a mask pattern and a shade part consisted of three pixels was shownthe above can attain the same function by setting up the composition of a deviceand the control method appropriatelyalso when a parallax picture is [the pixel of three or more piecesa translucent partand a shade part] four or more pieces.
[0111][Embodiment 3] Embodiment 3 is a modification for attaining the same effect as Embodiment 2.
[0112]Drawing 31 is an important section schematic diagram of 3D window part of this Embodiment 3.

[0113]In the figureas for 350the mask pattern 341 which becomes the display surface from the slit shape translucent part 342 and the shade part 343 with the optical modulator which has a back light source (light source means) and pixel structure with discrete 340 is formed. The translucent part 342 comprises the three pixels 344345346and the shade part 343 comprises three pixels similarly.
[0114]310 is a display device which comprises a liquid crystal panel etc.and the parallax picture of right-and-left-eyes correspondence of vertical stripe shape is displayed on the display surface.
[0115]In the case of this Embodiment 3if the display device 310 is a liquid crystal panel of a colored presentationthe rgb light filter for a colored presentation will be considered as the color-balance of a display imagesuch as using a horizontal stripe methodbecoming normal.
[0116]The cover glass of the display device 310 and the optical modulator 340a polarizing platean electrodeetc. are omitted and shownand the display image of a display surface and mask pattern shape are displayed typically. El and Er show an image observation person's right and left eyesrespectively.
[0117]Herethe mask pattern 341 which consists of a translucent part displayed on the optical modulator 340 and a shade part is explained using drawing 32.
[0118]Drawing 32 shows the front view of the mask pattern 341 shown in drawing 31.
[0119]As shown in the figurethe mask pattern 341 comprises the translucent part 342 and the shade part 343 of the horizontal pitch Hm. The translucent part 342 comprises the three 1-pixel-wide partial stripes 344345346and the shade part 343 comprises three stripes similarly. Nextthe synthesizing method is explained using drawing 33 about the parallax picture displayed on the display device 310.
[0120]As two parallax picture g(i) of right-and-left-eyes correspondence and g (i+n) illustrated in the figureit divides into the strip image of much vertical stripe shapeIt can stand in a line for every scanning lineparallax picture g(i)strip image g(i)j created from g (i+n)and g(i+n) j are changedand it is considered as the synthetic parallax picture g (ii+n). Howeveroriginal parallax picture g(i) used for composition and g (i+n) use the parallax picture explained by Embodiment 2.
[0121]Nextan operation of a stereoscopic picture display is explained using drawing 34.
[0122]Drawing 34 is a horizontal sectional view of 3D window part.
[0123]In the figurethe light from the back light source 350 is ejected from the translucent part 342 of the mask pattern 341 of the optical modulator 340and is irradiated by exposure parallax picture field gs(i) and gs (i+n) in an observer's position.
[0124]Although it becomes irregular with the synthetic parallax picture displayed on the display device 310 formed between the optical modulator 340 and the observerthe light flux irradiated by field gs(i)Since it passes along strip image g(i)of line form compounded from parallax picture g(i) shown by drawing 33 in the state of the graphic display 1g(i)3g(i)5and --the parallax picture G1 is observed in the field of gs(i).

[0125]Heresince the translucent part 242 of the mask pattern comprises the three pixels 244245246the light flux which passed along each pixel will irradiate with the subregion of the field 347348349respectively.
[0126]Similarlyalthough it becomes irregular with the synthetic parallax picture displayed on the display device 310 formed between the optical modulator 340 and the observerthe light flux irradiated by the field gs (i+n)In this casesince it passes along strip image g(i+n) 2 g(i+n)4 of the line form compounded from the parallax picture g (i+n) shown by drawing 33and g(i+n)6 —the parallax picture g (i+n) is observed in the field of gs (i+n).
[0127]Thereforeparallax picture g(i) and g (i+n) are set as the eyeball El and the parallax picture corresponding to Erand by putting both eyes on this fieldan observer will separate and observe each parallax picture by an eye on either sideand can observe a stereoscopic picture.
[0128]Herethe constituent conditions of the optical system in a horizontal section are explained using drawing 34.
[0129]As shown in the figurethe horizontal width of the translucent part 342 of Lw1 and the mask pattern 341 for the distance from Lw2 and the observation position defined beforehand to the display device 310 Hmw[the distance of the mask pattern 341 and the display device 310] When setting [the horizontal pitch to an adjacent translucent part] the interval of the right and left eyes of Ph and an observer to E for Hm and the pixel width of the display device 310it constitutes so that the following conditions may be fulfilled.
[0130]
2xE/Hm = Lw1/Lw2 ..... Formula 1Lw1/(Lw1+Lw2) = 2xPh/Hm ..... Formula 22xHmw = Hm ..... Formula 3 drawing 35 – drawing 37 are the explanatory views showing the situation of a corporal vision typically.
[0131]In drawing 35a left-hand side figure is the principal part of the horizontal sectional view (X-Z section) of a displayand the mask pattern 341 of the optical modulator 340the synthetic parallax picture 311 displayed on the display device 310and the exposure parallax picture 390 irradiated by the observer position are shown in right-hand side. The exposure parallax picture 390 shows the state where it consists of a parallax picture of parallax picture g(i) and g (i+n)and the figure has an observer's right and left eyes El and Er in the position of parallax picture g(i) and g (i+n).
[0132]When an observer moves to a left and changes into the state of drawing 36 in the state as it isor when it moves to the right direction and changes into the state of drawing 37 (i.e.when the parallax picture of g (i+n) and g(i) is observed by right and left eyesrespectively)it becomes a reverse corporal vision and normal solid observation becomes impossible.
[0133]Belowthe function in which observation of an always normal stereoscopic model is possibleand a what is called surroundings lump display which can perform

observation of the picture from which the viewpoint changed according to an observer's motion is possible is explained using drawing 38 – drawing 41without the state of a reverse corporal vision arisingalso when an observer's viewpoint changes.
[0134]By the following explanationin order to explain plainlythe case of n= 3 is explained. Detection of the view information to be used is based on the method described in Embodiment 1.
[0135]Drawing 38 is drawing 35 and status idemand at this timeright and left eyes are observing parallax picture g(i) and g (i+3)respectively as above-mentionedand show the state of a normal corporal vision.
[0136]These right and left eyes from the state where it is located in the positions 8 and 11 of the exposure parallax picture 390respectively. When an observer movesas it is shownfor example in drawing 39when right and left eyes go into the fields 7 and 10 on the left of [one] three subregionsthe synthetic parallax picture 311 of a display Former g(i)The parallax picture of g (i+3) displays g (i+1) and g (i+4) on the line currently displayedrespectivelyand as shown in a figureit moves the translucent part 342 of the mask pattern 341 to the 1-pixel right. As shown in a figurethe parallax pictures g (i+1) and g (i+4) are displayed on the exposure parallax picture 390 by this.
[0137]By controlling in this wayan observer will observe g (i+1) and g (i+4) by right and left eyesrespectivelyand can observe the picture from which the viewpoint changed in the state of the normal corporal vision.
[0138]So that it may illustrate in the state where the right and left eyes of drawing 40 which the observer moved to the right are located in the positions 9 and 12 of the exposure parallax picture 390g (i-1) and g (i+2) are displayed on the exposure parallax picture 390 like a graphic display by displaying g (i-1) and g (i+2) on the synthetic parallax picture 311 of a display like a graphic displayand moving the translucent part 342 of the mask pattern 341 to the 1-pixel leftas shown in a figure. From this statefurther in the state of drawing 41 which the observer moved to the right directionThe parallax pictures g (i-2) and g (i+1) are displayed on the exposure parallax picture 390 by the position of a graphic display by displaying g (i-2) and g (i+1) on the synthetic parallax picture 311and changing the mask pattern 341 to the state of a graphic display. Hereaftersame control is performed to movement of an observer's right and left.
[0139]As mentioned aboveby switching the synthetic parallax picture and mask pattern which are displayed on a display according to a viewpoint one by oneand displaying them using many parallax picturesa reverse corporal vision does not arise but the solid observation in which a surroundings lump display is possible is attained.
[0140]Although the number of the parallax pictures displayed simultaneously is two and the case where the translucent part of a mask pattern and a shade part consisted of three pixels was shownthe above can attain the same function by setting up the composition of a deviceand the control method appropriatelyalso when parallax pictures are three or more pieces and four or more pixelsrespectively.

[0141][Embodiment 4] The stereoscopic picture display device of this invention is made easy for Embodiment 4 to add improvement to Embodiments 1-3and to use.
[0142]Embodiment 4 is described using drawing 48 from drawing 42. The member which has the same function as Embodiments 1-3 attaches the same numberomits explanationand explains it focusing on a point of difference with Embodiments 1-3.
[0143]Drawing 42 is an outline view of this Embodiment 4.
[0144]The point that the viewpoint detecting mechanism 420 is attached to the upper part of a display the point of difference with the outline view of Embodiment 1the camera control means 450 for operating manually the function of the change over switch 431441 for the change of the electrical signal explained in full detail behindand the video camera 121 of the viewpoint detecting mechanism 420 — andWhen an observer is in a solid observation impossible fieldor when the viewpoint detection by the viewpoint detecting mechanism 420 is impossible for a certain reasonit is the point of having the warning means 460 for emitting warning to an observer.
[0145]The control means 450 of the camera is equipped with the save switch 451 for recording the image of a camerathe zoom of a camerabreadand the camera manual operation button 452 that operates a tilt.
[0146]Drawing 43 is a system block figure of Embodiment 4.
[0147]Signal switching means (1) 430 and signal switching means (2) 440 which contain the change over switch 431441 in which the point of difference with system block drawing 2 of Embodiment 1 was shown in the outline view 42 as the elementrespectivelyIt is the point that the video-signal recording device 480 for recording the camera control means 450the signal processing means 470 which processes the video signal from that of the viewpoint detecting mechanism 420and its signaland the warning means 460 which operates for the information from the viewpoint detection means 420 were added.
[0148]Although the viewpoint detecting mechanism 420 serves as the same system as system block drawing 2 explained by Embodiment 1The viewpoint detecting mechanism 420 comprises Embodiment 4 so that the information which operates the video camera 121 which outputs the photoed video information signal and constitutes the viewpoint detecting mechanism 420 with a view information signal can also be outputted and inputted.
[0149]An operation of each member is explained below.
[0150]When the observer of the display indicator 110 operates signal change over switch (1) 431 on the occasion of display usecamera manipulate signalssuch as a video signal from the viewpoint detecting mechanism 420 and zoombreadand a tiltare outputted to the external terminal A shown in drawing 43.
[0151]Using this video signal and a manipulate signalby a publicly known means by which it does not illustrateit becomes exchangeable [the information on a remote place]and the video camera 121 constituted viewpoint detecting mechanism 420 functions as the video camera for teleconferencesor a camera for surveillance.

[0152]Thereforein this embodimentthe viewpoint detecting mechanism 420 is attached to the upper part of a displayin order to detect an observer's viewpointit not only can photo an observer's headbut the wider range as the object for teleconferences or an object for surveillance can be photoedand the camera operation from a remote place is possible. the observer who explained signal change over switch (2) 441 by Embodiment 1 — it is a switch for producing the template of eyes using the photographed image of the person himself/herself.
[0153]Signal change over switch (2) If 441 is operatedconnection will change from the usual image processing means 270 to the signal processing means 470andas for the display drive circuit 260the signal-processing result of the signal processing means 470 will be displayed on the display 210.
[0154]The video signal photoed with the video camera 121 is supplied to the signal processing means 470and the image is displayed on the display 210 by operation of signal change over switch (2) 441.
[0155]The index almost corresponding to an observer's both eyes to a center of the display 210 is simultaneously overlapped by operation of the signal processing means 470and it is displayed.
[0156]With the interlock switch within the signal change over switch (2) signal processing means 470 interlocked with 441simultaneously The zoom of the video camera 121 of the viewpoint detecting mechanism 420Camera operation of breada tiltetc. switches to hand controland it becomes possible by operating the camera control means 450 to operate the video camera 121 through the signal processing means 470.
[0157]Drawing 44 is an explanatory view for explaining the index superimposed on the display 210.
[0158]In the figure483 is a display screen of a display and 481482 is a circular index corresponding to an observer's both eyes.
[0159]That neighborhood that each size of both this index 481482 is regular zoom magnifying powerand contains the eyes of an observer in case an observer observes the display 210 in a standard positionand eyesOr it is set as the size of the component of eyessuch as luster of eyesand both interval is set as the standard interocular distance of an observer's image.
[0160]Since it is generally located in the position [observation position / standard] shifted when an observer observes the display 210the index position set up beforehand and the image position of both eyes are not in agreement. Thenan observer operates the camera manual operation button 452 provided in the camera control means 450 described previouslyand both eyes are made to agree in an index position.
[0161]Drawing 45 is superimposed on the index 481482 by the observer 280and shows the display screen 480 in the state where the eye of the observer's 280 image 281 was in agreement with the index 481482.

[0162]Drawing 46 is the enlarged drawing and the template 284285 of the eye explained by Embodiment 1 and the face area 283 are displayed as reference.
[0163]An observer records the image of an observer's eyes on the image recording device 480 by checking that eyes have been in agreement with the index 481482and operating the save button 451 provided in the camera control means 450.
[0164]View information is acquired by the method stated to Embodiment 1 using this recorded image as the template 284285.
[0165]rather than using a general-purpose image as a template -- an observer -- position information is [be / using the image of the person himself/herself 280 / accuracy / it / better] detectable.
[0166]Although the display 210 was used for displaying an observer's face image in this embodimentit is also possible to use another natural exclusive monitor.
[0167]Nextan operation of the warning means 460 of drawing 42 is explained using drawing 47 and drawing 48.
[0168]Drawing 47 is an explanatory view in which an observer is the mimetic diagram of signs that the state where the display indicator 110 was observed was seen from the topi.e.the horizontal sectional view of the display indicator 110and explains the possible field of normal solid observation of Embodiment 4.
[0169]Howeverthe figure stops an operation of the viewpoint detecting mechanism 420 temporarily for explanationand shows the case where a corporal vision flattery function is not used.
[0170]In the figure110 shows a display indicator and El and Er show the right and left eyes of the observer of standard observation position Lh1. E is standard interocular distance.
[0171]The indicator 110 of a display has solid observation normally possible for an observerwhen an observer's viewpoint exists in the field of the quadrangle described by the thick line in the figure in the case of the observer of interocular distance equal to standard interocular distancesince an internal configuration is completely the same as that of Embodiment 1 in the width W. In a direction (an observer's cross direction) vertical to the 110th page of a display indicatordistance between displays is not made with an observerand solid observation cannot be performed out of the range of Lh1max to Lh1min of a figure.
[0172]When the observer of the interocular distance e or a face is leaned and the distance of the horizontal component between eyes is set to eLh1max and Lh1min turn into Lmax and Lminrespectivelyas shown in a figure.
[0173]When the viewpoint detecting mechanism 420 is made to act and a corporal vision region flattery function is used hereabout a direction (an observer's longitudinal direction) parallel to a display surfacethe possible range of a corporal vision spreads in the possible range of viewpoint detection and corporal vision region follow-up controlbut. Perpendicularly (cross direction)the possible range of a corporal vision does not changebut the normal corporal vision of it becomes impossible except

Lmax−Lmin.
[0174]Drawing 48 is a taken image of the viewpoint detecting mechanism 420 under display operation of Embodiment 4 equivalent to drawing 20 of Embodiment 1.
[0175]Also when an observer gets mixed upas Embodiment 1 explainedthe size of this face picture is kept constant by operation of an auto zoom mechanismbut. By computing the real space distance e of horizontal component Te from horizontal component Te of the both−eyes interval of the template then detectedthe zoom of a photographing camerabreadand tilt informationand computing Lmax and Lmin from the valueOut of an order [this] fieldit warns an observer of a corporal vision being impossible by operating the warning means 460.
[0176]Also when detection of the face area described by Embodiment 2 or detection of the eye by a template is not able to detect for a certain reasonthis warning means 460 can be operated.
[0177]Although the independent warning means was established in this embodimentit is also possible to display warning on the display indicator 110.
[0178]
[Effect of the Invention]Also when according to this invention an observer (**− 1) moves and a viewpoint changes as mentioned abovesolid observation with an always normal observer which detects a viewpoint with sufficient accuracy and which carries out a detection owner can be performed.
(**−2) the picture always normal solid observation is possiblewithout a reverse corporal vision arisingalso when the parallax picture displayed simultaneously consists of two parallax pictures corresponding to right−and−left both eyesan observer moves and a viewpoint changesand corresponding to the viewpoint — being observable .
(**−3) When an observer was located out of [observable] a conditionwarning was displayed and the observer's convenience was improved [making the video camera for viewpoint detection usable to other uses such as a video camera for teleconferencesor]. A stereoscopic picture display device with which effect can be attained.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The outline view of Embodiment 1 of this invention
[Drawing 2]The system block figure of Embodiment 1 of this invention
[Drawing 3]The lumbar part schematic diagram of the display indicator of Embodiment 1 of this invention
[Drawing 4]The explanatory view of the mask pattern of Embodiment 1 of this invention
[Drawing 5]The explanatory view of parallax picture composition of Embodiment 1 of

this invention
[Drawing 6]The explanatory view of the optical work of Embodiment 1 of this invention
[Drawing 7]The explanatory view of the optical work of Embodiment 1 of this invention
[Drawing 8]The explanatory view of the optical work of Embodiment 1 of this invention
[Drawing 9]The explanatory view of the optical work of Embodiment 1 of this invention
[Drawing 10]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 11]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 12]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 13]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 14]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 15]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 16]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 1 of this invention
[Drawing 17]The system block figure of the viewpoint detecting mechanism of Embodiment 1 of this invention
[Drawing 18]The screen in which the image of the observer in the short focus side of Embodiment 1 of this invention is shown
[Drawing 19]The screen in which the image of the observer in the regulation focus of Embodiment 1 of this invention is shown
[Drawing 20]The enlarged drawing of the face area of Embodiment 1 of this invention
[Drawing 21]The explanatory view of the template of the eye of Embodiment 1 of this invention
[Drawing 22]The explanatory view of parallax picture composition of Embodiment 2 of this invention
[Drawing 23]The explanatory view of the photographing method of the parallax picture used by Embodiment 2 of this invention
[Drawing 24]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 25]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 26]The explanatory view of the method of presentation of the synthetic

parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 27]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 28]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 29]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 30]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 2 of this invention
[Drawing 31]The lumbar part schematic diagram of the display indicator of Embodiment 3 of this invention
[Drawing 32]The explanatory view of the mask pattern of Embodiment 3 of this invention
[Drawing 33]The explanatory view of parallax picture composition of Embodiment 3 of this invention
[Drawing 34]The explanatory view of the optical work of Embodiment 3 of this invention
[Drawing 35]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 36]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 37]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 38]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 39]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 40]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 41]The explanatory view of the method of presentation of the synthetic parallax picture and mask pattern of Embodiment 3 of this invention
[Drawing 42]The outline view of Embodiment 4 of this invention
[Drawing 43]The system block figure of Embodiment 4 of this invention
[Drawing 44]The explanatory view of the superposition index of Embodiment 4 of this invention
[Drawing 45]The superposition index of Embodiment 4 of this inventionand the explanatory view of a photography image
[Drawing 46]The expansion explanatory view of the superposition index of Embodiment 4 of this inventionand a photography image
[Drawing 47]The explanatory view of the corporal vision feasible region of Embodiment 4 of this invention

[Drawing 48]The explanatory view of the detection interocular distance of Embodiment 4 of this invention

[Description of Notations]

100 The main part of a stereoscopic picture display device
110 Display indicator
111 3D window
120 and 420 Viewpoint detecting mechanism
121 The video camera of a viewpoint detecting mechanism
122 Taking lens
123 Video photographing means
124 Zoom control means
125 Camera universal head
126 Graphic processing means
127 Camera control means
210 display (display device)
211 and 311 Synthetic parallax picture
220 longitudinal lenticular lens (vertical cylindrical lens array)
230 horizontal lenticular lens (lateral cylindrical lens array)
240 and 340 Optical modulator
241 and 341 Mask pattern
244 and 344 Pixel of the translucent part of an optical modulator
245 and 345 Pixel of the translucent part of an optical modulator
246 and 346 Pixel of the translucent part of an optical modulator
242 and 342 Translucent part of a mask pattern
243 and 343 Shade part of a mask pattern
247 and 347 Exposure parallax picture subregion
248 and 348 Exposure parallax picture subregion
249 and 349 Exposure parallax picture subregion
250350 back light sources
260 Display drive circuit
270 Image processing means
280 Observer
281 An observer's picture
282 Photography screen
283 The detected face area
284285 Template of eyes
290 and 390 Exposure parallax picture
320 Light modulator driving circuit
330 Signal synthesizing circuit
430 Signal switching means (1)
431 Signal change over switch 1

440 Signal switching means (2)
441 Signal change over switch 2
450 Camera control means
451 Save button
452 Zoombreada tilt button
460
470 Signal processing means
480 Video-signal recording device
480 Display screen
481 and 482 Superposition index
E observer's standard interocular distance
The horizontal component of E observer's interocular distance
El observer's left eye
Er observer's right eye
G (1)G (2)g(i)and g (i+n) Parallax picture
G (12) and g (ii+n) Synthetic parallax picture
GS1GS2gs(i)and gs (i+n) Exposure parallax picture field
The pitch of the vertical cylindrical lens which constitutes Hl longitudinal lenticular lens
The horizontal pitch of the translucent part of Hm mask pattern
Hmw Horizontal width of the translucent part of a mask pattern
Scaled distance of Lh1 observer and a longitudinal lenticular lens
Maximum distance between the observer in whom a Lmax corporal vision is possibleand a display
The shortest distance between the observer in whom a Lmin corporal vision is possibleand a display
Maximum distance between the observer in whom the corporal vision in Lh1max standard interocular distance is possibleand a display
The shortest distance between the observer in whom the corporal vision in Lh1min standard interocular distance is possibleand a display
Scaled distance of Lh2 longitudinal lenticular lens and a mask pattern
Lv1 Scaled distance of a display device and a horizontal lenticular lens
Lv2 Scaled distance of a horizontal lenticular lens and a mask pattern
Lw1 Scaled distance of an observer and a display device
Lw2 Scaled distance of a display device and a mask pattern
The number of the pixels which constitute the translucent part of n mask patternand a shade part
Width of the direction of X of the stripe pixel on Ph display device
Width of the direction of Y of the stripe pixel on Pv display device
The horizontal component of the interocular distance of Te display image
XYa Z coordinate

Vl The pitch of the horizontal cylindrical lens which constitutes a horizontal lenticular lens
Width of the perpendicular direction of the translucent part of Vm mask patternand a shade part
Width of W display indicator